

What is claimed is:

1. An optical information recording device which irradiates information light holding information and reference light onto a recording medium using an object lens, causes interference in the information recording layer of the recording medium, and records information using the resultant interference patterns, comprising:

a first spatial light modulator for generating said information light by spatially modulating light from a light source by a plurality of pixels; and

a second spatial light modulator for generating said reference light by spatially modulating light from the light source by a plurality of pixels; wherein

- 10 the area of said information light and the area of said reference light on the entrance pupil surface of said object lens are formed such that one area surrounds the other area, and

said reference light is spatially modulated by said second spatial light modulator such that interference is not easily generated between said reference lights in said information recording layer.

- 15 2. An optical information recording device which irradiates information light holding information and reference light onto a recording medium using an object lens, causes interference in the information recording layer of the recording medium, and records information using the resultant interference patterns, comprising:

a first spatial light modulator for generating said information light by spatially modulating light from a light source by a plurality of pixels and

a second spatial light modulator for generating the reference light by spatially modulating light from the light source by a plurality of pixels; wherein

the area of said reference light on the entrance pupil surface of said object lens is formed such as to surround the area of said information light, and

- 25 said reference light is spatially modulated into a plurality of radial patterns spreading radially from the area of said information light, in the area of said reference light, by said second spatial light

modulator.

3. An optical information recording device which irradiates information light holding information and reference light onto a recording medium using an object lens, causes interference in the  
5 information recording layer of the recording medium, and records information using the resultant interference patterns, comprising:

a first spatial light modulator for generating said information light by spatially modulating light from a light source by a plurality of pixels; and

- a second spatial light modulator for generating said reference light by spatially modulating  
10 the intensity of the light from the light source by a plurality of pixels; wherein

the area of said reference light on the entrance pupil surface of said object lens is formed such as to surround the area of said information light.

4. The optical information recording device according to any one of claims 1 to 3, wherein said  
15 first spatial light modulator and said second spatial light modulator comprise a first display area and a second display area of a shared spatial light modulator, respectively.

5. The optical information recording device according to claim 4, wherein said spatial light  
modulator comprises a plurality of pixels which can modulate the intensity of light, and the phases of  
20 emission lights vary according to the positions of a plurality of said pixels.

6. The optical information recording device according to claim 5, wherein the phase distribution of the emission light from said spatial light modulator has the cyclic pattern which deflects the traveling direction of said reference light in a direction other than the optical axis direction of the  
25 optical system.

7. An optical information recording method which irradiates information light holding information and reference light onto a recording medium using an object lens, causes interference in the information recording layer of the recording medium, and records information using the resultant interference patterns, wherein:

5           both said information light and said reference light are spatially modulated by a plurality of pixels;

          the area of said information light and the area of said reference light on the entrance pupil surface of said object lens are formed such that one area surrounds the other area; and

          said reference light is spatially modulated such that interference is not easily generated  
10   between the reference lights in said information recording layer.

8. An optical information recording method which irradiates information light holding information and reference light onto a recording medium using an object lens, causes interference in the information recording layer of the recording medium, and records information using the resultant  
15   interference patterns, wherein:

          both said information light and said reference light are spatially modulated by a plurality of pixels;

          the area of said reference light on the entrance pupil surface of said object lens is formed such as to surround the area of said information light; and

20           said reference light is spatially modulated into a plurality of radial patterns spreading radially from the area of said information light, in the area of said reference light.

9. The optical information recording method according to claim 8, wherein the center of the area of said information light, the center of the area of said reference light, and the virtual center point of  
25   said plurality of radial patterns are the optical axes of the optical system.

10. The optical information recording method according to claim 8, wherein a plurality of reference lights with differing pattern-forms are formed by changing the virtual center angle between a plurality of said radial patterns or by rotating said plurality of radial patterns with the virtual center point as a center of rotation, and multiplex recording of a plurality of interference patterns are performed in a plurality of superimposed areas within said information recording layer using said plurality of reference lights with differing pattern-forms.

11. An optical information recording method which irradiates information light holding information and reference light onto a recording medium using an object lens, causes interference in the information recording layer of the recording medium, and records information using the resultant interference patterns, wherein:

both said information light and said reference light are spatially modulated by a plurality of pixels; and

the area of said reference light on the entrance pupil surface of said object lens is formed such as to surround the area of said information light and is asymmetrical to the center of the area of said reference light, as well.

12. An optical information recording method which irradiates information light holding information and reference light onto a recording medium using an object lens, causes interference in the information recording layer of the recording medium, and records information using the resultant interference patterns, wherein:

light intensities of both said information light and said reference light are spatially modulated by a plurality of pixels; and,

the area of said information light and the area of said reference light on the entrance pupil surface of said object lens are formed such that one area surrounds the other area.

13. The optical information recording method according to claim 12, wherein the area of said information light is wider than that of said reference light, and the light intensity per unit area in the area of said reference light is greater than that in the area of said information light.

5 14. The optical information recording method according to any one of claims 7 to 13, wherein both said information light and said reference light are spatially modulated by the same spatial light modulator.

15. The optical information recording method according to claim 14, wherein the light intensity  
10 and phase of said reference light are spatially modulated by said spatial light modulator.

16. The optical information recording method according to claim 15, wherein the traveling  
direction of said reference light is deflected in a direction other than the optical axis direction of the  
optical system by said spatial light modulator.

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17. An optical information reproduction device for generating reproduction light holding  
information and reproducing the information by irradiating reference light onto a recording medium  
through an object lens and making the reference light interfere with the interference patterns recorded  
on the information recording layer of the recording medium, comprising:

20 a spatial light modulator for generating said reference light by spatially modulating  
light from a light source by a plurality of pixels; wherein

the area of said reference light on the entrance pupil surface of said object lens  
regarding said reference light and the area of said reproduction light on this entrance pupil surface are  
formed such that one area surrounds the other area, and

25 said reference light is spatially modulated by said spatial light modulator such that  
interference is not easily generated between reference lights in said information recording layer.

18. An optical information reproduction device for generating reproduction light holding information and reproducing the information by irradiating reference light onto a recording medium through an object lens and making the reference light interfere with the interference patterns recorded on the information recording layer of the recording medium, comprising:

a spatial light modulator for generating said reference light by spatially modulating light from a light source by a plurality of pixels; wherein

the area of said reference light on the entrance pupil surface of said object lens regarding said reference light is formed such as to surround the area of said reproduction light on this entrance pupil surface, and

said reference light is spatially modulated into a plurality of radial patterns spreading radially from the area of said reproduction light in the area of said reference light by said spatial light modulator.

19. An optical information reproduction device for generating reproduction light holding information and reproducing the information by irradiating reference light onto a recording medium through an object lens and making the reference light interfere with the interference patterns recorded on the information recording layer of the recording medium, comprising:

a spatial light modulator for generating said reference light by spatially modulating light from the light source by a plurality of pixels; wherein

the area of said reference light on the entrance pupil surface of said object lens regarding said reference light and the area of said reproduction light on this entrance pupil surface are formed such that one area surrounds the other area.

20. The optical information reproduction device according to any one of claims 17 to 19, wherein said spatial light modulator comprises a plurality of pixels which can modulate the intensities of lights,

and the phases of emission lights vary according to the positions of a plurality of said pixels.

21. The optical information reproduction device according to claim 20, wherein the phase distribution of the emission light from said spatial light modulator has the cyclic pattern which deflects the traveling direction of said reference light in a direction other than the optical axis direction of the optical system.

22. An optical information reproduction method for generating reproduction light holding information and reproducing the information by irradiating reference light onto a recording medium through an object lens and making said reference light interfere with said interference patterns recorded on the information recording layer of said recording medium, wherein:

said reference light is spatially modulated by a plurality of pixels;

the area of said reference light on the entrance pupil surface of said object lens regarding said reference light and the area of said reproduction light on this entrance pupil surface are formed such that one area surrounds the other area; and

said reference light is spatially modulated by said spatial light modulator such that interference is not easily generated between reference lights in said information recording layer.

23. An optical information reproduction method for generating reproduction light holding information and reproducing the information by irradiating reference light onto a recording medium through an object lens and making said reference light interfere with said interference patterns recorded on the information recording layer of said recording medium, wherein:

said reference light is spatially modulated by a plurality of pixels;

the area of said reference light on the entrance pupil surface of said object lens regarding said reference light is formed such as to surround the area of said reproduction light on this entrance pupil surface; and

said reference light is spatially modulated into a plurality of radial patterns spreading radially from the area of said reproduction light in the area of said reference light.

24. The optical information reproduction method according to claim 23, wherein the center of the area of said reference light and the virtual center point of said plurality of radial patterns are optical axes of the optical system.

25. An optical information reproduction method for generating reproduction light holding information and reproducing the information by irradiating reference light onto a recording medium through an object lens and making said reference light interfere with said interference patterns recorded on the information recording layer of said recording medium, wherein:

said reference light is spatially modulated by a plurality of pixels; and

the area of said reference light on the entrance pupil surface of said object lens regarding said reference light is formed such as to surround the area of said reproduction light on this entrance pupil surface and is asymmetrical to the center of the area of said reference light, as well.

26. An optical information reproduction method for generating reproduction light holding information and reproducing the information by irradiating reference light onto a recording medium through an object lens and making said reference light interfere with said interference patterns recorded on the information recording layer of said recording medium, wherein:

light intensity of said reference light is spatially modulated by a plurality of pixels, and

the area of said reference light on the entrance pupil surface of said object lens regarding said reference light and the area of said reproduction light on this entrance pupil surface are formed such that one area surrounds the other area.



27. The optical information reproduction method according to any one of claims 22 to 26, wherein the light intensity and phase of said reference light are spatially modulated by a spatial light modulator.

5      28. The optical information reproduction method according to claim 27, wherein the traveling direction of said reference light is deflected in a direction other than the optical axis direction of the optical system by said spatial light modulator.

29. The optical information recording device according to any one of claims 1 to 6, comprising:

10                      a servo light source which differs from the light source for recording information to said recording medium; and

                         a servo information acquisition means for obtaining address servo information recorded to said recording medium by the light from said servo light source.

15      30. The optical information reproduction device according to any one of claims 17 to 21, comprising:

                         a servo light source which differs from the light source for recording information to said recording medium; and

                         a servo information acquisition means for obtaining address servo information  
20      recorded to said recording medium by the light from said servo light source.